Air-Sea Interaction in the Northern Gulf of Alaska

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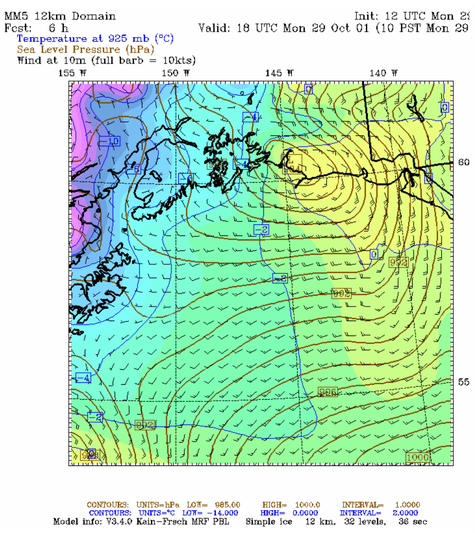
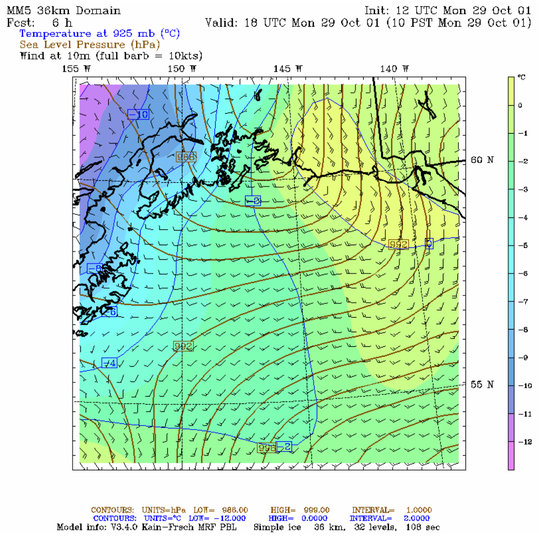
Resolving Atmospheric Structure in the Coastal Zone

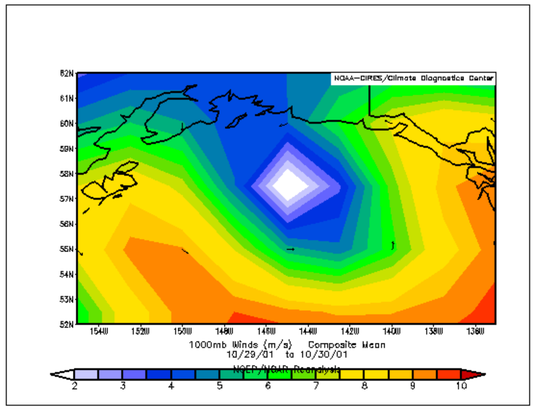


Temperature at 925 mb, sea level pressure and winds at 10 m from a 12 km resolution integration of the MM5 NWP model. Note the enhanced pressure gradients and coastal winds near Icy and Yakutat Bay.



Temperature at 925 mb, sea level pressure and winds at 10 m from a 36 km resolution integration of the MM5 NWP model.

The MM5 numerical weather prediction (NWP) model is being used to specify the atmospheric structure in the northern GOA for real-time and retrospective studies. Present and historical operational analyses for this region are too crude spatially to properly account for the effects of coastal terrain. A variety of field experiments have shown that high-resolution NWP models such as the MM5 can produce realistic, dynamically-consistent atmospheric fields along prominent coastal terrain. The example shown here illustrates the influence of model resolution on surface winds near the coast.



Distribution of 1000 mb winds (m/s) for 29-30 October 2001 from the NCEP Reanalysis. This map is based on data from a 2.5 degree grid. Note the tongue of weak winds extending from south-central Alaska into the northern GOA.

The Response to a Warm Season Upwelling Event

A period of moderate upwelling-favorable winds occurred in the northern Gulf of Alaska (GOA) during early July 2001. A line of moorings deployed by PMEL for GLOBEC show mixed layer shoaling and cooling nearshore, and mixed layer deepening and warming offshore. The mooring data shown here has just recently become available; further study of this event and other aspects of the air-sea interaction are being undertaken. In general, this analysis will focus on the relative roles of local atmospheric forcing versus internal oceanographic processes in terms of their effects on the evolution of the mixed layer.

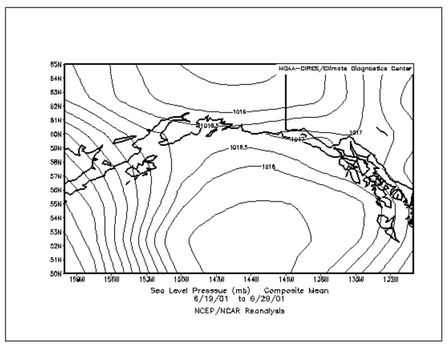


Fig. 1 Mean sea level pressure for the period 19-29 June 2001. Note the lack of systematic winds along the southeastern coast of the Kenai peninsula.

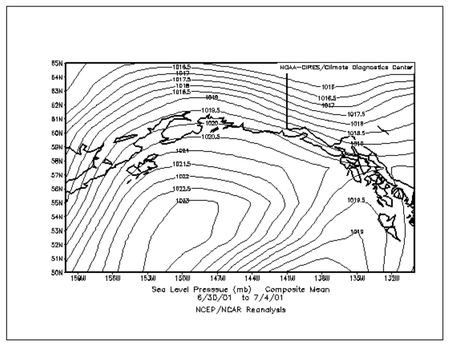


Fig. 2 As in Figure 1, but for the period 30 June - 4 July 2001. The high pressure in the central GOA producing upwelling-favorable wind anomalies of 3-4 m/s along the Kenai Peninsula.

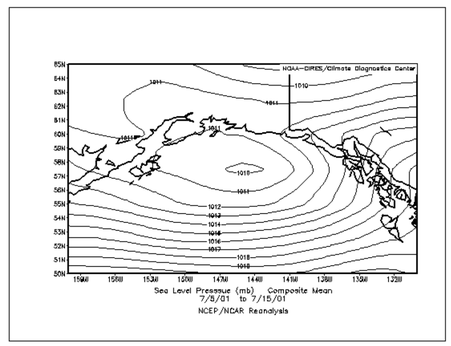
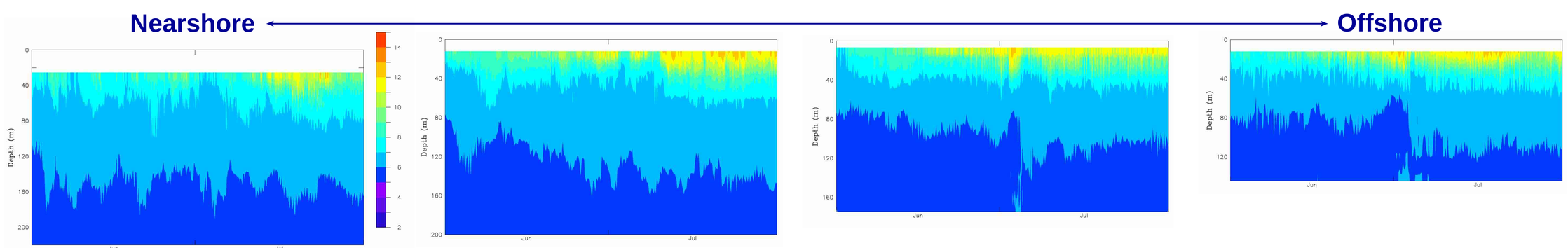


Fig. 3 As in Fig. 1, but for the period 5-15 July 2001. The weak low pressure center in the central GOA implies weak downwelling, in the mean, along the Kenai peninsula.



Temperature from moorings at four locations across the shelf